

lation, temperature was below normal in 4, above in 1, and exactly normal in 1.

That temperature is not always controlled by insolation seems evident from the above. The station having the greatest sunshine, Yuma, Ariz., 91 per cent, had also a temperature 1.5° below normal, while the station having the next to the least sunshine, Eastport, Me., 14 per cent, had at the same time a temperature 2.3° above normal. The low temperature at Yuma might be explained by the fact that two-thirds of the observed winds were from a northerly, and consequently colder quarter, while but one-tenth was from a southerly or warmer quarter. At Eastport much the same conditions prevailed, but with different results as to temperature; 50 per cent of the observed winds were from a northerly quarter, and but 23 per cent from a southerly quarter. We must assume that in the latter case the local winds at Eastport were but a part of a much larger mass of air of relatively higher temperature than usual, and this seems to have been the case. (See remarks of Prof. R. F. Stupart, page 499, of this REVIEW.)

*Average cloudiness and departures from the normal.*

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England .....	6.3	+0.7	Missouri Valley .....	4.7	-0.2
Middle Atlantic .....	5.8	+0.6	Northern Slope .....	4.6	0.0
South Atlantic .....	5.1	+0.6	Middle Slope .....	4.0	+0.4
Florida Peninsula .....	5.0	+0.4	Southern Slope .....	3.8	+0.6
East Gulf .....	5.3	+0.8	Southern Plateau .....	1.9	-0.4
West Gulf .....	5.3	+0.7	Middle Plateau .....	4.5	+1.2
Ohio Valley and Tennessee.	3.8	+0.1	Northern Plateau .....	7.2	+1.2
Lower Lake .....	7.2	0.0	North Pacific Coast .....	7.6	+0.8
Upper Lake .....	6.7	-0.3	Middle Pacific Coast .....	4.3	+0.5
North Dakota .....	4.6	-0.5	South Pacific Coast .....	2.0	-0.9
Upper Mississippi Valley...	4.8	-0.4			

### ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table IX, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and

auroras (A) in each State and on each day of the month, respectively.

**Thunderstorms.**—Three hundred and thirty-three reports of thunderstorms were received during the current month as against 511 in 1897, and 619 during the preceding month.

The dates on which the number of reports of thunderstorms for the whole country were most numerous were: 5th, 133; 21st, 29; 4th, 27; 9th, 25.

Reports were most numerous from Ohio, 48; Illinois, 40; Louisiana, 33; Missouri, 23.

**Auroras.**—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz, 1st, and from the 23d to the 30th.

The greatest number of reports were received for the following dates: 11th, 10; 3d and 21st, 5; 14th, 4.

Reports were most numerous from Montana, 11; Ohio, 7; North Dakota and Wisconsin, 5.

**In Canada.**—Auroras were reported as follows: Father Point, 3, 11, 21; Quebec, 2, 3, 11, 21; Port Arthur, 12; Minnedosa, 13, 21, 22; Qu'Appelle, 20, 21, 22; Swift Current, 21, 22; Battleford, 22, 23, 24; Prince Albert, 21, 22, 23.

The only thunderstorm reported was from Yarmouth, 6th.

### NOTES ON THE WEATHER OF THE WEST INDIES.

The weather was generally tranquil at all stations. A small disturbance was reported near Trinidad on the 6th, but it apparently disappeared by the morning of the 7th.

Thunderstorms were observed as follows: Colon, 3d, 12th, 14th, 16th, 19th; Bridgetown, 10th, 11th; Curaçao, 6th, 8th, 9th.

Nephoscope observations were generally begun during the month.

The telegraphing of weather reports for the season ceased on the 16th.

At this writing (January 6, 1899) the regular monthly reports for November from Kingston, Santiago, Santo Domingo, and Port of Spain have not been received.

### CLIMATE AND CROP SERVICE.

By JAMES BERRY, Chief of Climate and Crop Service Division.

The following extracts relating to the general weather conditions in the several States and Territories are taken from the monthly reports of the respective sections of the Climate and Crop Service. The name of the section director is given after each summary.

Rainfall is expressed in inches.

**Alabama.**—The mean temperature was 50.2°, or 3.3° below normal; the highest was 87°, at Goodwater on the 6th, and the lowest, 12°, at Oneonta on the 27th. The average precipitation was 5.60, or 2.64 above normal; the greatest monthly amount, 9.78, occurred at Healing Springs, and the least, 1.61, at Valleyhead.—*F. P. Chaffee.*

**Arizona.**—The mean temperature was 51.5°, or 1.0° below normal; the highest was 96°, at Parker on the 6th, and the lowest, 3°, at Flagstaff on the 9th and 12th. The average precipitation was 0.56 or 0.14 below normal; the greatest monthly amount, 1.75, occurred at Lochiel, and the least, trace, at Benson, Fort Mohave, Gila Bend, and Winslow.—*W. G. Burns.*

**Arkansas.**—The mean temperature was 47.5°, or 3.2° below normal, and is the lowest for November on record; the highest was 87°, at Stamps on the 5th, and the lowest, 9°, at Mossville on the 22d, and at Winslow on the 23d. The average precipitation was 3.20, or 0.98 below normal; the greatest monthly amount, 6.46, occurred at Elon, and the least, 1.50, at Lacrosse.—*E. B. Richards.*

**California.**—The mean temperature was 51.6°, or 1.3° below normal; the highest was 102°, at Pomona on the 7th, and the lowest, 11° below

zero, at Bodie on the 25th. The average precipitation was 0.99, or 1.20 below normal; the greatest monthly amount, 9.98, occurred at Crescent City, while none fell at many stations.—*W. H. Hammon.*

**Colorado.**—The mean temperature was 31.2°, or 3.1° below normal; the highest was 85°, at Minneapolis on the 7th, and the lowest, 20° below zero, at Breckenridge on the 22d. The average precipitation was 0.98, or 0.22 above normal; the greatest monthly amount, 4.14, occurred at Ruby, and the least, trace, at Hugo and Las Animas.—*F. H. Brandenburg.*

**Florida.**—The mean temperature was 65.0°, or normal; the highest was 94°, at Lakemont on the 4th and 5th, and the lowest, 30°, at Wausau on the 24th and 30th. The average precipitation was 2.57, or about normal; the greatest monthly amount, 7.53, occurred at De Funiak Springs, and the least, 0.40, at Lemon City.—*A. J. Mitchell.*

**Georgia.**—The mean temperature was 51.4°, or 3.1° below normal; the highest was 89°, at Hawkinsville on the 6th, and the lowest, 11°, at Diamond on the 27th. The average precipitation was 4.99, or 2.74 above normal; the greatest monthly amount, 7.90, occurred at Blakely, and the least, 2.96, at Cedartown.—*J. B. Marbury.*

**Illinois.**—The mean temperature was 38.0°, or 1.1° below normal; the highest was 80°, at Danville on the 4th, and the lowest, 6° below zero, at Lanark and Scales Mound on the 27th. The average precipitation was 2.21, or 0.73 below normal; the greatest monthly amount, 4.24, occurred at Atwood, and the least, 0.99, at New Burnside. Winter wheat and rye have made a heavy growth and are strong, vigorous, and well rooted. The growth has been so rank in many counties that wheat has been pastured. Generally the plants are in fine condition, although some damage by hessian fly is reported from central and southern counties.—*C. E. Linney.*

**Indiana.**—The mean temperature was 38.8°, or 2.1° below normal; the highest was 76°, at Washington on the 3d and 21st, and the lowest, zero, at Lafayette on the 26th. The average precipitation was 2.87, or 1.00 below normal; the greatest monthly amount, 4.66, occurred at Angola, and the least, 0.60, at Valparaiso. The weather during the month was quite favorable to winter crops. During colder weather near the end of the month they were well protected by snow covering in the central and northern portions, but in the southern portion, less snow having fallen, the crops suffered in some fields during the freezing weather. Wheat continued to be in good condition for wintering; it is deep rooted and vigorous, but rank in some fields.—*C. F. R. Wapenhans.*

**Iowa.**—The mean temperature was 32.2°, or slightly below normal; the highest was 78°, at Corning on the 3d, and the lowest, 17° below zero, at Spirit Lake on the 22d and at Algona on the 26th. The average precipitation was 1.46, or slightly below normal; the greatest monthly amount, 3.61, occurred at Indianola, and the least, 0.33, at What Cheer.—*G. M. Chappel.*

**Kansas.**—The mean temperature was 39.7°, or 1.6° below normal; the highest was 89°, at Medicine Lodge on the 4th, and the lowest, 10° below zero, at Wallace on the 22d and at Frankfort on the 23d. The average precipitation was 1.10, or 0.20 above normal; the greatest monthly amount, 2.25, occurred at Lebo, and the least, trace, at Coolidge and Wallace.—*T. B. Jennings.*

**Kentucky.**—The mean temperature was 43.5°, or 1.8° below normal; the highest was 80°, at Lyndon on the 4th, and the lowest, 10°, at Irvington and Shelby City on the 27th. The average precipitation was 2.79, or 1.32 below normal; the greatest monthly amount, 4.32, occurred at Alpha, and the least, 1.51, at Henderson. The weather was generally favorable to wheat, and it is reported in good condition.—*H. B. Hersey.*

**Louisiana.**—The mean temperature was 54.0°, or 4.0° below normal; the highest was 87°, at White Sulphur Springs on the 4th, and the lowest, 16°, at the same station on the 24th. The average precipitation was 6.96, or 3.16 above normal; the greatest monthly amount, 12.93, occurred at Donaldsonville, and the least, 4.28, at Shreveport.—*A. G. McAdie.*

**Maryland and Delaware.**—The mean temperature was 43.4°, or 1.9° below normal; the highest was 78°, at Pocomoke City, Md., on the 10th, and the lowest, 6° below zero, at Deerpark, Md., on the 28th. The average precipitation was 3.85, or 0.80 above normal; the greatest monthly amount, 5.62, occurred at Darlington, Md., and the least, 1.42, at Boettcherville, Md.—*F. J. Walz.*

**Michigan.**—The month was warmer than usual in the upper peninsula and in the northern counties; in the central counties there was a slight deficiency in temperature, while in the southern counties the temperature was 1.6° below normal; the highest was 73°, at Midland on the 4th, and the lowest, 7° below zero, at Humboldt on the 25th. The average precipitation was slightly below normal; the greatest monthly amount, 4.46, occurred at Coldwater, and the least, 0.75, at Lathrop.—*C. F. Schneider.*

**Minnesota.**—The mean temperature was 26.6°, or about normal; the highest was 69°, at Two Harbors on the 4th, and the lowest, 31° below zero, at Pokegama on the 24th. The average precipitation was 1.02, or about normal; the greatest monthly amount, 2.70, occurred at Willow River, and the least, 0.15, at Pipestone.—*T. S. Outram.*

**Mississippi.**—The mean temperature was 50.9°, or about 3.0° below normal; the highest was 88°, at Natchez on the 5th, and the lowest, 16°, at French Camp on the 22d and 23d. The average precipitation was 4.97, or 2.52 above normal; the greatest monthly amount, 9.60, occurred at Waynesboro, and the least, 2.27, at Hernando.—*W. T. Blythe.*

**Missouri.**—The mean temperature was 39.9°, or 2.3° below normal; the highest was 79°, at Marshall on the 7th, and the lowest, 8° below zero, at Pickering on the 23d. The average precipitation was 2.30, or about normal; the greatest monthly amount, 4.31, occurred at Appleton City, and the least, 0.85, at Conception. Alternate freezing and thawing, and the unusually low temperatures of the last decade of the month, were injurious to winter wheat, especially the late sown in those sections where there was little or no snow to protect it. The greater part of the crop, however, has made good growth during the fall and went into winter in good condition.—*A. E. Hackett.*

**Montana.**—The mean temperature was 27.8°, or about normal; the highest was 68°, at Crow Agency on the 6th, and the lowest, 24° below zero, at Manhattan on the 21st. The average precipitation was 0.76, or 0.33 below normal; the greatest monthly amount, 2.04, occurred at Fort Logan, and the least, 0.04, at Darby.—*E. J. Glass.*

**Nebraska.**—The mean temperature was 31.4°, or about 3.0° below normal; the highest was 81°, at Lynch on the 4th, and the lowest, 15° below zero, at Valentine on the 22d. The average precipitation was 0.57, or about 0.10 below normal; the greatest monthly amount, 1.60, occurred at Kimball, and the least, trace, at several southwestern stations.—*G. A. Loveland.*

**Nevada.**—The mean temperature was 35.1°, or about 3.0° below normal; the highest was 77°, at Candelaria on the 5th, and the lowest, 10° below zero, at Wells on the 24th. The average precipitation was 1.10, or 0.37 above normal; the greatest monthly amount, 5.95, occurred at Clover Valley, and the least, trace, at several stations.—*R. F. Young.*

**New England.**—The mean temperature was 37.7°, or about normal; the highest was 67°, at Lake Cochituate, Mass., on the 4th, and at Voluntown, Conn., on the 5th; and the lowest, 3° below zero, at Enosburg Falls, Vt., on the 26th. The average precipitation was 5.68 or 1.82 above normal; the greatest monthly amount, 11.01, occurred at Vineyard Haven, Mass., and the least, 1.30, at Cornwall, Vt.—*J. W. Smith.*

**New Jersey.**—The mean temperature was 42.4°, or 0.9° below normal; the highest was 70°, at Bridgeton on the 5th, at Cape May C. H. on the 9th, and at Woodbine on the 10th; the lowest was 11°, at Chester on the 26th. The average precipitation was 6.76, or 3.10 above normal; the greatest monthly amount, 9.07, occurred at Moorestown, and the least, 3.83, at Cape May City.—*E. W. McGann.*

**New Mexico.**—The mean temperature was 40.3°, or about 2.0° below normal; the highest was 85°, at Roswell on the 7th, and the lowest, 12° below zero, at Monero on the 22d. The average precipitation was 0.65, or about 0.20 above normal; the greatest monthly amount, 2.60, occurred at Fort Wingate, and the least, trace, at Rincon.—*R. M. Hardinge.*

**New York.**—The mean temperature was 38.1°, or 0.3° above normal; the highest was 75°, at Cedarhill on the 5th, and the lowest, 2° below zero, at Saranac Lake on the 27th. The average precipitation was 3.92, or 0.71 above normal; the greatest monthly amount, 8.90, occurred at Brentwood, and the least, 0.58, at Ogdensburg.—*E. G. Allen.*

**North Carolina.**—The mean temperature was 47.2°, or about 2.5° below normal; the highest was 81°, at Pittsboro on the 10th, and the lowest, 8°, at Highlands on the 27th. The average precipitation was 3.24, or about normal; the greatest monthly amount, 8.47, occurred at Highlands, and the least, 1.65, at Marshall.—*C. F. von Herrmann.*

**North Dakota.**—The mean temperature was 22.6°, or 2.9° below normal; the highest was 69°, at Fort Yates on the 1st, and the lowest, 30° below zero, at McKinney on the 23d. The average precipitation was 0.37, or 0.58 below normal; the greatest monthly amount, 1.19, occurred at Hamilton, and the least, trace, at Ellendale, Steele, and University.—*B. H. Bronson.*

**Ohio.**—The mean temperature was 38.8°, or 1.8° below normal; the highest was 76°, at Upper Sandusky on the 3d, and the lowest, 2°, at Millport on the 28th. The average precipitation was 3.17, or 0.21 below normal; the greatest monthly amount, 5.52, occurred at Levering, and the least, 2.01, at Demos. Fall sown grains made a good growth, and where not damaged by fly and grubworm the fields are more promising than usual at this season of the year.—*J. Warren Smith.*

**Oklahoma.**—The mean temperature was 45.6°; the highest was 88°, at Healdton, Chickasaw Nation, on the 19th, and the lowest, 5°, at Norman on the 23d. The average precipitation was 1.04; the greatest monthly amount, 2.36, occurred at Tahlequah, and the least, 0.44, at Woodward. Throughout the eastern section and portions of central and northern sections winter wheat is in very fair condition and has afforded good pastures. Throughout the south, west, and northwest the ground has been too dry and wheat is not looking so well. Throughout these sections the absence of sufficient rain during the planting season prevented as much ground being sown as had been prepared. Most of the ground remaining unplanted at close of October was seeded this month.—*J. I. Widmeyer.*

**Oregon.**—The mean temperature was 41.0°, or 2.3° below normal; the highest was 73°, at Langlois on the 13th, at Prineville on the 24th, and at Toledo on the 1st; the lowest was zero, at Silverlake on the 8th. The average precipitation was 6.76, or 1.57 above normal; the greatest monthly amount, 19.83, occurred at Government Camp, and the least, 1.01, at Dayville. The weather conditions were very favorable for plowing and seeding. The grain sown in the dust east of the Cascades was well packed down by the November rains, and by the close of the month it had made a good growth. Those east of the Cascades who waited for rains before seeding have been delayed in their work. Owing to the active prosecution of work, a much larger acreage than usual has been sown.—*B. S. Pague.*

**Pennsylvania.**—The mean temperature was 40.0°, or 0.4° above normal; the highest was 73°, at Johnstown on the 4th, and the lowest, 2°, at Saegerstown on the 28th. The average precipitation was 4.03, or 0.89 above normal; the greatest monthly amount, 7.34, occurred at Quakertown, and the least, 1.44, at Hollidaysburg.—*T. F. Townsend.*

**South Carolina.**—The mean temperature was 51.0°, or 4.1° below normal; the highest was 82°, at Shaws Fork on the 9th, and the lowest, 14°, at Clemson College on the 27th. The average precipitation was 4.72, or 2.11 above normal; the greatest monthly amount, 6.41, occurred at Gillisonville, and the least, 2.58, at Yorkville. Much wheat and oats were sown, but the soil was too wet in places for this work. The cool weather was, however, favorable for grain that was up, but retarded germination of that recently sown.—*J. W. Bauer.*

**South Dakota.**—The mean temperature was 27.4°, or about 4.0° below normal; the highest was 80°, at Cherry Creek, on the 6th, and the lowest, 21° below zero, at Ashcroft on the 21st. The average precipitation was 0.28, or 0.31 below normal; the greatest monthly amount, 1.03, occurred at Rockford, and the least, trace, at Shiloh and Wessington Springs.—*S. W. Glenn.*

**Tennessee.**—The mean temperature was 45.3°, or about 1.8° below normal; the highest was 80°, at Madison on the 4th, and the lowest, 6°, at

at Erasmus on the 27th. The average precipitation was 3.34, or about 0.50 below normal; the greatest monthly amount, 5.83, occurred at Sylvia, and the least, 1.73, at Silverlake. The weather was unfavorable for farm work, especially the seeding of winter wheat.—*H. C. Bates.*

*Texas.*—The mean temperature for the State, determined by comparison of 35 stations distributed throughout the State, was 3.4 below the normal. There was a general deficiency ranging from 1.0° to 6.2°, with the greatest over east Texas and the coast district. The highest was 98°, at Fort Ringgold on the 5th and at Fort McIntosh on the 7th, and the lowest, 13°, at Amarillo on the 22d. The average precipitation for the State, determined by comparison of 36 stations distributed throughout the State, was 0.19 below the normal. Nearly normal conditions prevailed over the panhandle. There was a slight deficiency over east, central, southwest, and west Texas, and the western portion of north Texas, and a deficiency of more than 1.00 over the eastern portion of north Texas, while there was a general excess over the coast district. The greatest monthly amount, 5.97, occurred at Jasper, while none fell at Menardville and Sanderson. Much wheat was sown during the month and the showers at the opening of the second decade were very beneficial for the crop. Early sown wheat suffered for rain at the opening of the month and some died, leaving a poor stand in localities over the western portion of the wheat belt.—*I. M. Chline.*

*Utah.*—The mean temperature was 35.4°; the highest was 82°, at Moab on the 7th, and the lowest, 8° below zero, at Woodruff on the 20th.

The average precipitation was slightly above normal; the greatest monthly amount, 3.44, occurred at Huntsville, and the least, trace, at Pahreah, St. George, and Tropic.—*J. H. Smith.*

*Virginia.*—The mean temperature was 44.6°, or about 2.5° below normal; the highest was 80°, at Wytheville on the 3d, and the lowest, 6°, at Burkes Garden on the 28th. The average precipitation was 2.59, or 0.11 above normal; the greatest monthly amount, 4.77, occurred at Spottsville, and the least, 1.50, at Salem.—*E. A. Evans.*

*Washington.*—The mean temperature was 39.8°, or 1.5° below normal; the highest was 75°, at Bridgeport on the 1st, and the lowest, 8°, at Waterville on the 16th. The average precipitation was 5.35, or 0.80 below normal; the greatest monthly amount, 15.60, occurred at Neah, and the least, trace, at Bridgeport.—*G. N. Salisbury.*

*Wisconsin.*—The mean temperature was 32.2°, or slightly above normal; the highest was 72°, at Knapp on the 3d, and the lowest, 34° below zero, at Osceola on the 24th. The average precipitation was 1.34, or 0.35 below normal; the greatest monthly amount, 2.45, occurred at Medford, and the least, 0.38, at Chilton.—*W. M. Wilson.*

*Wyoming.*—The mean temperature was 28.2°, or 3.2° below normal; the highest was 76°, at Fort Laramie on the 1st, and the lowest, 20° below zero, at Lovell on the 21st. The average precipitation was 0.83, or 0.07 above normal; the greatest monthly amount, 2.10, occurred at Evanston, and the least, 0.03, at Fort Washakie.—*W. S. Palmer.*

## SPECIAL CONTRIBUTIONS.

## NOTES BY THE EDITOR.

Owing to sickness these sections are omitted in order that the REVIEW may be published on time.

## METEOROLOGICAL TABLES AND CHARTS.

By A. J. HENRY, Chief of Division of Records and Meteorological Data.

Table I gives, for about 130 Weather Bureau stations making two observations daily and for about 20 others making only one observation, the data ordinarily needed for climatological studies, viz, the monthly mean pressure, the monthly means and extremes of temperature, the average conditions as to moisture, cloudiness, movement of the wind, and the departures from normals in the case of pressure, temperature, and precipitation, the total depth of snowfall, and the mean wet-bulb temperatures. The altitudes of the instruments above ground are also given.

Table II gives, for about 2,700 stations occupied by voluntary observers, the highest maximum and the lowest minimum temperatures, the mean temperature deduced from the average of all the daily maxima and minima, or other readings, as indicated by the numeral following the name of the station; the total monthly precipitation, and the total depth in inches of any snow that may have fallen. When the spaces in the snow column are left blank it indicates that no snow has fallen, but when it is possible that there may have been snow of which no record has been made, that fact is indicated by leaders, thus ( . . . ).

Table III gives, for about 30 stations furnished by the Canadian Meteorological Service, Prof. R. F. Stupart, director, the means of pressure and temperature, total precipitation and depth of snowfall, and the respective departures from normal values, except in the case of snowfall.

Table IV gives, for 26 stations selected out of 113 that maintain continuous records, the mean hourly temperatures deduced from the Richard thermographs described and figured in the Report of the Chief of the Weather Bureau, 1891-92, p. 29.

Table V gives, for 26 stations selected out of 104 that maintain continuous records, the mean hourly pressures as auto-

matically registered by Richard barographs, except for Washington, D. C., where Foreman's barograph is in use. Both instruments are described in the Report of the Chief of the Weather Bureau, 1891-92, pp. 26 and 30.

Table VI gives, for about 130 stations, the arithmetical means of the hourly movements of the wind ending with the respective hours, as registered automatically by the Robinson anemometer, in conjunction with an electrical recording mechanism, described and illustrated in the Report of the Chief of the Weather Bureau, 1891-92, p. 19.

Table VII gives, for all stations that make observations at 8 a. m. and 8 p. m., the four component directions and the resultant directions based on these two observations only and without considering the velocity of the wind. The total movement for the whole month, as read from the dial of the Robinson anemometer, is given for each station in Table I. By adding the four components for the stations comprised in any geographical division the average resultant direction for that division can be obtained.

Table VIII gives the total number of stations in each State from which meteorological reports of any kind have been received, and the number of such stations reporting thunderstorms (T) and auroras (A) on each day of the current month.

Table IX gives, for about 70 stations, the average hourly sunshine (in percentages) as derived from the automatic records made by two essentially different types of instruments, designated, respectively, the thermometric recorder and the photographic recorder. The kind of instrument used at each station is indicated in the table by the letter T or P in the column following the name of the station.

Table X gives a record of rains whose intensity at some